REMARKS:

The above amendments are believed to deal with each of the issues raised in the official action under reply. Specifically, page 2 of the specification has been amended to update the citation of the prior application, claims 10 to 12 and 14 have been cancelled and claim 13 has been amended to overcome the 35 U.S.C. 112 objection, and the remaining claims have been amended to ensure that they patentably distinguish the present invention from the cited Shindo et al patent.

It is worth noting that applicant has invented a relatively simple apparatus for controlled the dissolved gas content of an aqueous liquid in which the aqueous and gaseous phase pressures on the two sides of a membrane are such that, in operation, there is simultaneous mass transfer through the membrane of a first gas in the gaseous phase into the liquid phase and of a second gas dissolved in the aqueous liquid into the gaseous phase, whereby the gas content of the first gas in the aqueous phase is increased, the gas content of the second gas in the gaseous phase is decreased and the total dissolved gas pressure of the aqueous phase is altered.

While the Shindo et al apparatus does bear some similarity to the apparatus described in the present application, the Shindo et al apparatus does not utilize differential pressure control means for controlling the inlet pressure of a gaseous phase, as claimed in amended claim 9 and consequently in each of the remaining claims in this application. As described in paragraph [0050] of applicant's specification, the use of a differential pressure controller (in this case a differential pressure control valve 54) ensures that the pressure of the gas (oxygen) entering the apparatus is maintained up to but not exceeding the liquid (water) pressure.

Shindo et al teaches the use of a microporous, hydrophobic hollow fibre which is gas permeable and liquid impermeable. The specification states that when it is intended to cause a gas to be absorbed by water or an aqueous liquid "it is not always necessary to keep the flowing gas pressure higher than the pressure in liquid flow channel which is separated by the wall membrane of the hollow fibre from the gas flow". The specification goes on to state that when it is intended to promote the feeding of a gas into a liquid it is desirable to set the pressure in the fluid channel at a higher level than the pressure level of the liquid channel inside the hollow fibre (col. 7, lines 57 to 61). While the specification discusses the control of fluid and liquid pressure inside and outside of the microporous fibres, there is no indication of how such control is effected. In contradistinction, as mentioned above, each of the claims in this application calls for a simple and effective way of controlling the pressure of a gas in a microporous, hydrophobic hollow fibre, namely the differential pressure control means.

The Shindo et al process and apparatus are limited to mass transfer into a liquid phase, which is always present in the bore of the fibres (see col. 2, lines 35 to 39, and each of Examples 1-5). This shows a lack of understanding of the principles of mass transfer. During mass transfer of a dissolved gas to or from a liquid, the rate limiting step is the transfer of molecules between the bulk liquid and the gas/liquid interface. The flow of liquid in the bore of a hollow fibre is laminar. In the examples cited, the Reynolds number of the 'bore bound' fluids is much less than 100. As a result, the mass transfer will always be very slow, compared to when the liquid is on the outside of the fibres. Furthermore, liquid flowing through the bore of a fibre has a significant pressure drop associated with it compared to liquid flow

outside of the fibres. This pressure drop results in increased energy requirements. As well, the larger pressure drops limit the flow capacity of a mass transfer device.

Claim 13 of this application states that the liquid phase supplying means is connected to the outside of the membrane, and the gaseous phase supplying means is connected to the inside of the membrane, i.e. the gas flows through the inside of the fibre and the liquid flow is on the outside of the fibre. Thus, the combination of elements called for in claim 13 is not taught by Shindo et al.

In summary, it is submitted that the Shindo et al reference does not teach or even suggest the combination of elements now claimed in this application.

The other prior art listed in the official action under has been reviewed and does not overcome the deficiencies of the Shindo et al reference.

Early and favourable reconsideration of this application is requested.

Yours sincerely,

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